

August 6, 1993

SECOND ANNOUNCEMENT' -- CALL FOR PAPERS

PLANETARY DATA VISUALIZATION WORKSHOP

November 15-17, 1993

San Juan Capistrano Research Institute
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San Juan Capistrano, California 92675

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Sponsored by
NASA Solar System Exploration Division
San Juan Institute

INTRODUCTION

This mailing provides information on *workshop content, abstract submittal, pre-registration, and local logistics* for the Visualization Workshop. This should help you prepare for your participation in the meeting and make travel arrangements. The workshop will be held at the San Juan Capistrano Research Institute, and will bring together NASA, university, and industry researchers who are using or developing visualization techniques suitable for Planetary-Science research or educational applications. There will be one more brief mailing shortly before the Workshop with last minute news and a preliminary program. We are looking forward to an excellent meeting.

WORKSHOP CONTENT AND PURPOSE

The workshop emphasis will be on ~~assessing and improving materials, techniques, and technology that allow visualization of planetary science data or models.~~ This extends from use of these techniques in scientific research and analysis, through the visualization of natural scientific environments and processes, and finally to scientific presentation and illustration and education. Presentations at the workshop can focus on any of these elements. Of particular interest are representations of multi-spectral imagery, spectrophotometric, topographic, and various other geological, geophysical, and geochemical parameters and processes -- and the ways such multidimensional planetary science data can be combined in space-or time-dimensions for purposes of analysis, interpretation, and representation.

Data sets (and target planets) of special interest to this workshop range from Mercury to Triton, and include those from Viking (Mars), Voyager (outer planets and satellites), Magellan (Venus), Galileo (Moon, Earth, Jupiter, Galilean satellites), and Mars Observer missions.

Goals of this NASA and San Juan institute sponsored workshop will be to: (1) review past successes and current capabilities in visualization of planetary data and models, (2) define what needs to be done technologically and programmatically to improve the visualization and utilization of present

VISUALIZATION OF TELEMETRY MISSION DATA FOR PUBLIC EDUCATION: THE GALILEO EARTH ENCOUNTER EXPERIENCE AT THE SMITHSONIAN NATIONAL AIR AND SPACE MUSEUM; Paul C. Fisher and Theodore C. Clarke, Jet Propulsion Laboratory, California Institute of Technology, Pasadena CA

One of the challenges of exposing the public to the activities and results of the space program lies in providing an opportunity to experience the immediacy of key space exploration events. The second Galileo Earth encounter in December of 1992 provided an opportunity to involve the public as a spectator at a more immediate and compelling level than the standard news media presentations. During the month of December 1992, the Smithsonian National Air and Space Museum provided space in the 'Looking At Earth' gallery for a real-time workstation display of the events of the Galileo Earth encounter. The exhibit was designed and implemented by Galileo Project staff from the Jet Propulsion Laboratory and was staffed during the encounter by Galileo and SAIC employees. This talk will present some of the constraints on the system design and how the resulting system performed during the encounter.

The fundamental goal of the Smithsonian exhibit was to provide a focal point for explaining the Galileo mission in general, and specifically the Earth encounter, to the general public. Based on previous experiences with a real-time data display setup during the first Galileo Earth encounter at the 1990 Fall AGU (1), it was decided early in the system design that real-time data would be a key part of the exhibit. However, it was also recognized early on that the museum audience would be quite different from the technical audience at a professional science conference. Of critical importance in any public presentation is to have backup displays and information presentations for those periods when planned or unplanned telemetry outages prevent the display of real-time data. This was particularly important during the Galileo encounter since it was known in advance there would be a two hour gap in telemetry centered around the closest approach event itself. The other major constraints were that the entire design implementation could not incur any major costs, could not require significant new software development, must be a highly robust system that could be shutdown and restarted easily by individuals unfamiliar with advanced workstations or the details of the system components, must fit in a very limited space, must use easily available commercial components, must not require any unusual temperature or power environments, and could not excessively tax the JPL Galileo flight team.

In response to the constraints, it was determined to implement the exhibit using a low cost micro-computer outfitted with an array of network and audio-visual cards instead of attempting to use a high performance workstation. The final design consisted of a Macintosh IIx micro-computer with 32 MB of memory, a 500 MB hard drive, a 20" Radius monitor, a T1 (1.544 megabits-per-second) Internet network link and a Radius TV card for displaying standard TV on the computer monitor. The software consisted of an X Windows server (MacX), a 1 HyperCard stack containing Galileo images from previous encounters as well as general project information charts, a specially developed mission clock application and the Radius TV display software. The 1 Hypercard stack and the mission clock represent the only software elements which required any development at JPL, and the total level of work required to implement the system was approximately one work week of software development and one day of on-site system integration,

The operational plan was to use the 1 Hypercard stack to present an overview of the Galileo project, Earth and Lunar encounter geometries and the planned Earth encounter science activities. The mission clock ran continuously in the background to provide a status of distance from Earth and time until or since the closest approach. The MacX

Window server provided a means for displaying real-time data displays generated by the Galileo science teams and sent to the micro-computer via the Internet. For the Smithsonian exhibit, displays generated at the University of Iowa depicting the data received from the Plasma Wave experiment (PWS) were presented in real-time. The data flow for the real-time data consisted of a real-time data link between a data server at JPL and a display client program running at the University of Iowa which was accessed directly from the Smithsonian exhibit by the Macintosh X Window server application. The real-time display could also be replayed, which provided a very useful means of showing lengthy periods of data acquired during the encounter. The Radius TV board was used to provide access to a Galileo produced video describing the goals and mission of the Galileo Project and to provide access to NASA Select TV broadcasts of encounter related press conferences. An interactive terminal connection back to JPL (via telnet) was also available to the exhibit staff to provide electronic communications with JPL should any problems arise.

The entire system worked flawlessly for the entire exhibit period. During the occasional periods when the real-time data flow was unavailable, the other display sources and the ability to display snapshots of the real-time or replay portions of it insured that the exhibit remained active and interesting. Due to the limited time and resources available for the design of the system, it was not developed as a user interactive system and it did require exhibit staff to operate the system and explain the displayed information. However, given enough time and advanced planning such an unstaffed interactive display could certainly be developed for any planetary mission. The entire experience was very positive and clearly demonstrated the ability to quickly construct a means for public access to a major space mission event using commercially available and easily implemented components. While this specific exhibit utilized a Macintosh micro-computer, any system capable of Internet access and X window serving could have been utilized. The availability of advanced audio-visual and hyper-media capabilities at the micro-computer level open up a wide range of possibilities for extending such public access to the space program beyond museums. As network technology expands to the secondary school level, or perhaps utilizing access such as serial line internet protocol (SLIP), bringing such access to the classroom is clearly a near term possibility.

(1) Clarke, T.C. (1991) information Systems Newsletter, issue 21, pp 53-54.

and future planetary-science data sets, and (3) to show how improved visualization techniques and planetary-science data sets and research results can be made more available and useful to researchers, educators, and the general public.

The results of the workshop will aid NASA Headquarters in developing and maintaining two programmatic objectives: (1) a coherent program for support of visualization research activities in planetary and related science areas, and (2) a program for translating planetary data sets for use by the education community.

Participants attending the workshop should plan on arriving the evening of November 14 and staying through noon on the 17th. The outcome of the workshop will be a panel discussion to be held on Wednesday morning, November 17, 1993, and a summary document to be produced following the end of the workshop. A video record of the entire workshop will be made to aid in this process.

SCIENTIFIC PROGRAM: CALL FOR ABSTRACTS (Due Oct. 4, 1993)

Scientific and technical presentations are solicited on the topics of the Workshop outlined above. Please use the enclosed format (or a reasonable copy of it) for your abstract(s), limited to two pages per abstract. Presentations will be considered whether or not you have already submitted a title.

The Organizing Committee will prepare a program of oral presentations consisting of both invited talks and contributed papers. Other contributions can be made by poster talk or hardware/software exhibit. A rough program outline is enclosed. The length of presentations will be determined by the Program Committee, but a typical contribution accepted for oral presentation may be assigned 15 minutes for presentation plus 5 minutes for discussion. Please state your preferences on the abstract form.

We encourage presentations by both oral or poster talk. Both kinds of presentations require an abstract submittal. Multiple abstract submittals are permissible.

We encourage equipment exhibits and active hardware demonstrations at the Workshop (no exhibit or demo fees will be charged, but abstracts are required). You should discuss your needs with us in advance to assure that we can provide adequate space, power, etc.

For oral presentations there will be two screens, each with 35 mm and overhead projectors, and one VCR (super-VHS) with color monitor. Each poster display should be no larger than 1.1 X 1.1 meter, mounted vertically with push pins or tacks -- no adhesive strips! There is ample room for displays to be left up throughout the meeting. Tables will be available for reprint distribution, and other objects of interest.